

Pediatric firearm injuries: A 5 year single-center experience

Evaluation of pediatric firearm injuries

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Abstract

Aim: Firearm-related injuries are causes of severe morbidity and mortality among pediatric injuries. An average number of pediatric firearm violence incidents for the USA is about 20 000 annually. In this study, we aimed to evaluate firearm injuries in the pediatric population. We aimed to contribute to national data on firearm violence characteristics.

Material and Method: In total, eleven patients admitted to the emergency department during a 5-year period with firearm injury were evaluated. The Glasgow Coma Scale (GCS), Injury Severity Score (ISS), injured body part, consulting knowledge, hospital stay duration, and the healing and mortality rates of the patients were described.

Results: The majority of the victims were male (n=8, 72.7%), the average age was 12.7 years, the average GC and IS scores at the presentation were 14.6 and 27.45, respectively. The cause of rime was not reported in a significant number of the cases (n8, 72.7%), and extremities were the most wounded area. No mortality was reported in the study.

Discussion: Firearm injuries are one of the common medicolegal issues. Because of violence in society, children may frequently be subjected to firearm injuries during incidents of crossfire, peer violence, and family conflicts. To date, there is limited information on short-term clinical outcomes and resource utilization in pediatric patients who sustain a firearm injury.

Firearm-related injury is a life-threatening emergency that contributes to 0.3% of the total pediatric mortality in childhood for our country. Evaluation of firearm violence characteristics will lead to a better understanding of the incidences and will aid in establishing preventive policies.

Keywords

Emergency; Firearm injury; Violence; Childhood

Introduction

Firearm injuries are an important public health problem, contributing substantially to premature death and disability of children. Understanding their nature and impact is the first step toward prevention [1].

Homicides, suicides, and accidental deaths that involve firearms are more common in the United States of America (USA) than in other high-income countries. The incidence of firearm mortality in children continues to increase in the USA [2-3].

Pediatric firearm injuries provide information about children and their environment, access to weapons, neglect, or exposure to violence [4-5].

Firearm injury is also one of the severe causes of death in children and adolescents in our country. In Turkey, 0.3% of the deaths have occurred due to firearms; this rate is similar to the rates in other countries and is a significant public health problem for our country [6].

We aimed to identify the reasons and the frequency of pediatric firearm injuries in our region, since firearm injuries have preventable factors such as access to weapons, seeing or presenting them as toys and family recklessness.

Material and Methods

The study data were obtained with a retrospective scan of data collected from the hospital information processing system and archive records of pediatric patients. The patients involved in the study had presented to the Emergency Medicine Clinic of the tertiary hospital of Düzce University between 01/01/2015-31/01/2019 with a firearm injury.

Patients under the age of 18 with firearm injuries were included in the study, and adult patients and patients with missing data were excluded from the study. In the patient files, age, gender, injured body area, the department consulted, the department hospitalized in, the length of hospital stay, the ISS scores, permanent sequelae, and the mortality were recorded.

Information regarding the patients' consultation, hospitalization, and referral were also evaluated.

When defining the firearm entry zone, the patient's body was divided into six regions as the head, neck, thorax, abdomen, upper extremity, and the lower extremity.

Ethics committee approval was obtained from the Düzce University Ethics Committee on 2.3.2020 with the number 202038.

Statistical data analysis:

Data analysis was carried out using the Statistical Package for Social Sciences (SPSS, version 24.0) software. The data were expressed as percentages, mean ± standard deviation (SD), and median values. Descriptive statistics were used.

Results

A total of 11 cases were evaluated in the study. The number of male patients with a firearm injury was higher than the number of girls: 8/3 patients, respectively. The average age of the patients was identified as 12.73 + 3.2 years. The demographic characteristics and the initial presentation of clinical scores (GCS, ISS) of the patients who had presented with firearm injuries have been presented in detail in Table 1. The length of hospital stay was evaluated in hours.

Table 1. Demographic features of patients presenting with a firearm injury

	N (min-max) Total=11	Mean (SD)
Age (years)	11(6-17)	12,73 (3.2)
Gender		
Male	8 (8-17)	
Female	3(6-14)	
GCS	11 (13-15)	14,64 (0,8)
ISS	11 (4-75)	27,45 (31)
Hospitalization duration (hours)	11 (2-312)	83.18 (121.2)

*GCS: Glasgow Coma Scale; ISS: Injury Severity Score

Table 2. Distribution of the reasons for and the injury sites of the firearm injury case

		Number (Total n=11)	Ratio (%)
Reason for incident	Accidental	3	27.3
	Unknown	8	72.7
Injury Site	Head	2	18.2
	Thorax	2	18.2
	Abdomen	1	9.1
	Extremity	4	36.4
	Multiple injuries	2	18.2

Table 3. Outcomes and sequelae of the firearm injury case

		Number (n)	Ratio (%)
Outcome	Discharged	4	36.4
	Ward	4	36.4
	Intensive Care Unit	3	37.3
	Total	11	100.0
Follow-up in the ward	Pediatric surgery	1	14.2
	Neurosurgery	1	14.2
	Orthopedics	3	42.8
	Pediatric intensive care unit	2	28.5
	Total	7	100.0
Sequelae	None	7	63.6
	Neurological sequelae	1	9.1
	Vision loss	1	9.1
	Peripheral nerve damage	2	18.2
	Total	11	100.0
Consultations	Pediatric surgery	5	45.5
	Brain surgery	3	27.3
	Chest surgery	1	9.1
	Ophthalmology	2	18.2
	ENT	1	9.1
	Orthopedics	4	36.4

Cases with a firearm injury were evaluated according to the reason for the incident. Patients were also grouped according to the region of the major injury for evaluation. Detailed information related to the patients' injury sites and the reason



Figure 1. The aortic injury and the bullet are seen on aortic angiography



Figure 2. Mediastinal hematoma and hemothorax due to a firearm injury, thoracic tomography

for the incident have been presented in Table 2.

All patients who had presented with a firearm injury had undergone consultative evaluation. At least one discipline had been required for consultation of the patients (for one patient: ear, nose, and throat diseases), and most commonly, the pediatric surgery department had been consulted (for five patients). Four patients had multiple traumas, one patient had pneumothorax + hematoma, two patients had abdominal trauma + hemothorax, and one patient had nasal trauma + abdominal trauma.

Detailed information about the patients' hospitalization or discharge after the diagnosis and evaluation in the emergency department and post-discharge follow-ups and diseases are presented in Table 3.

Discussion

Firearm injuries are one of the common medicolegal issues. Because of violence in society, children may frequently be subjected to firearm injuries during incidents of crossfire, peer

violence, and family conflicts.

For years, firearms have been an essential factor in attacks, crimes, and murders involving young men [7]. In the study conducted by Ashley E. Wolf et al., it was identified that firearm injuries were inflicted by adolescent males between the ages of 15-17 (74.8%) [8]. In our study, the average age of the cases was determined as 12.7 years, and our male to female ratio was 3:1. The results of our study support the literature.

In case of firearm injuries, thoracic and abdominal injuries are observed in 6-42% of cases [9]. In general, many thoracic injuries may be observed and can be treated non-operatively by placing the chest tube [10].

In our study, 27.2% (n=3) of the cases had a thoracic injury, and 27.2% had an abdominal injury. In one patient, the foreign body (bullet) was detected between the lower edge of the thoracic vertebra and the aorta on the tomography scan (Figure 1). In this patient, aortic injury, mediastinal hematoma, and subsequent hemothorax were considered. The patient was deemed suitable for referral by an air ambulance due to the need for endovascular surgery. In such injuries, the benefit of air transport for survival cannot be overlooked, and it should be considered at the moment when it becomes apparent that the institution's facilities are not sufficient. A chest tube was placed in one patient. Since extremity injuries were the most common, the most frequently consulted department was the orthopedics department (36.4%).

Several scoring systems have been developed over the past few decades to assess the severity of trauma and predict patient mortality and morbidity. ISS is one of the most frequently used scoring systems [11]. It has been reported that the morbidity and mortality rates of firearm injuries range between 3-31.4% and 7-46%, respectively [12]. Although there is no particular value for the ISS score, it has been reported that the predictability of mortality and morbidity increases as the value increases. It has been found that an ISS score of over 25 is directly related to mortality [13]. The most critical factors for mortality are an accompanying picture of shock, multiple injured organs, multiple blood transfusions, accompanying thoracic trauma, and the time needed to reach the hospital. In our study, despite the high ISS score value, we had no fatal cases. The reason for our low mortality rates may be the small number of cases in the study and the transfer of patients to the hospital in a short time. Further studies are needed to develop the approach and care of trauma cases and to predict the probable outcomes. Our permanent sequelae rate was determined as 36.4%.

Pediatric firearm injuries and deaths due to the injuries are a significant public health problem and cause early death, illness, and disability in children every year. Understanding the nature of firearm violence against children is an essential step. Finding ways to prevent such injuries and providing safe environment for all children will continue to be one of our top priorities.

Scientific Responsibility Statement
The authors declare that they are responsible for the article's scientific content including study design, data collection, analysis and interpretation, writing, some of the main line, or all of the preparation and scientific review of the contents and approval of the final version of the article.

Animal and human rights statement
All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with

the 1964 Helsinki declaration and its later amendments or comparable ethical standards. No animal or human studies were carried out by the authors for this article.

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Conflict of interest

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